Remedial Design/Remedial Action Work Plan for Operable Unit 3-13, Group 6, Buried Gas Cylinders

1. INTRODUCTION

The Idaho National Engineering and Environmental Laboratory (INEEL) is divided into 10 waste area groups (WAGs) to better manage environmental operations mandated under a *Federal Facility Agreement and Consent Order* (FFA/CO) (DOE-ID 1991). The Idaho Nuclear Technology and Engineering Center (INTEC), formerly the Idaho Chemical Processing Plant (CPP), is designated as WAG 3. Operable Unit (OU) 3-13 encompasses the entire INTEC facility.

Operable Unit 3-13 was investigated to identify potential contaminant releases and exposure pathways to the environment from individual sites as well as the cumulative effects of related sites. Ninety-nine release sites were identified in the *OU 3-13 Remedial Investigation/Feasibility Study* (RI/FS), of which 46 were shown to have a potential risk to human health or the environment (Rodriguez et al. 1997). The 46 sites were divided into seven groups based on similar media, contaminants of concern (COC), accessibility, or geographic proximity. The *OU 3-13 Record of Decision* (DOE-ID 1999a) identifies remedial design/remedial action (RD/RA) objectives for each of the seven groups. The seven groups are

- Tank Farm Soils (Group 1)
- Soils Under Buildings and Structures (Group 2)
- Other Surface Soils (Group 3)
- Perched Water (Group 4)
- Snake River Plain Aquifer (Group 5)
- Buried Gas Cylinders (Group 6)
- SFE-20 Hot Waste Tank System (Group 7).

The *Final Record of Decision* (ROD) for OU 3-13 was signed in October 1999. This comprehensive ROD presents the selected remedial actions for the seven groups, including the removal and treatment of the buried gas cylinders identified as Group 6.

This *RD/RA Work Plan* identifies and describes in detail the work elements required to remove and treat compressed gas cylinders identified at site CPP-84. This *Work Plan* also provides a detailed project budget and work schedule, including FFA/CO enforceable milestones.

NOTE: Throughout this *RD/RA Work Plan*, there are numerous reference made to the Idaho Department of Administration Procedure Act (IDAPA) hazardous waste regulatory citations. The Idaho Department of Environmental Quality (DEQ) is no longer a division under the Idaho Department of Health and Welfare (IDHW), and therefore, the applicable citations have been revised to reflect this change. The citations throughout this document however still use the previous numbering scheme to maintain consistency with the ROD that was prepared before the series had changed. For the purposes of this document where the IDAPA 16 series are referenced, it is understood that this in fact refers to the new series, IDAPA 58.

1.1 Background

INTEC is located in the south-central area of the INEEL in southeastern Idaho (see Figure 1-1). From 1952 to 1992, operations at INTEC primarily involved reprocessing spent nuclear fuel from defense projects, which entailed extracting reusable uranium from the spent fuels. Site CPP-84 is located approximately 366 m (1,200 ft) west of the INTEC security fence (see Figure 1-2). Anecdotal evidence from interviews of personnel involved and available records indicate that approximately 40 and 100 compressed gas cylinders were buried at this location after construction of the INTEC facility in 1952. Records and anecdotal evidence indicate that these cylinders contained construction gases (acetylene, compressed air, argon, carbon dioxide, helium, nitrogen, and oxygen). Site CPP-94 is located approximately 610 m (2,000 ft) to the northeast of the INTEC security fence. Six hydrofluoric acid (HF) cylinders have been retrieved from Site CPP-94.

CPP-84 characterization activities were completed to provide more information concerning the contents and spatial distribution of the compressed gas cylinders. A high-resolution magnetic survey was performed; the surveys clearly show the boundaries of the buried cylinders at CPP-84.

1.2 Selected Remedy

The OU 3-13 ROD describes three remedial alternatives for Group 6, Compressed Gas Cylinders. These alternatives are

- "No Action" with Monitoring
- Removal, Treatment, and Disposal
- Containment.

These alternatives were evaluated on the basis of protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARARs); long- and short-term effectiveness; reduction of toxicity, mobility, or volume of contaminants; implementability; and cost. Based on these evaluation criteria, removal, treatment, and disposal was selected as the remedy.

1.3 Scope

The OU 3-13 ROD requires the removal, treatment, and disposal of compressed gas cylinders at Sites CPP-84 and CPP-94. Cylinder removal from CPP-94 has been completed. The scope of remedial activity at CPP-84 is based on the contaminants present and the distribution of cylinders. Details concerning remedial operations at CPP-84 are provided throughout the remainder of this document.

1.3.1 Site CPP-84 Scope

The remedial activities at CPP-84 will be completed in two phases. The first phase is the excavation and segregation of cylinders from the burial grounds. Following the removal of the cylinders, confirmation soil samples will be collected from the floor of the excavation. The second phase consists of the sampling, treatment, and disposal of the cylinders. Sampling the contents of each cylinder will be conducted using remotely operated equipment and an on-Site laboratory. Based on the analytical results of cylinder contents, the method of treatment will be determined. It is anticipated that treatment methods

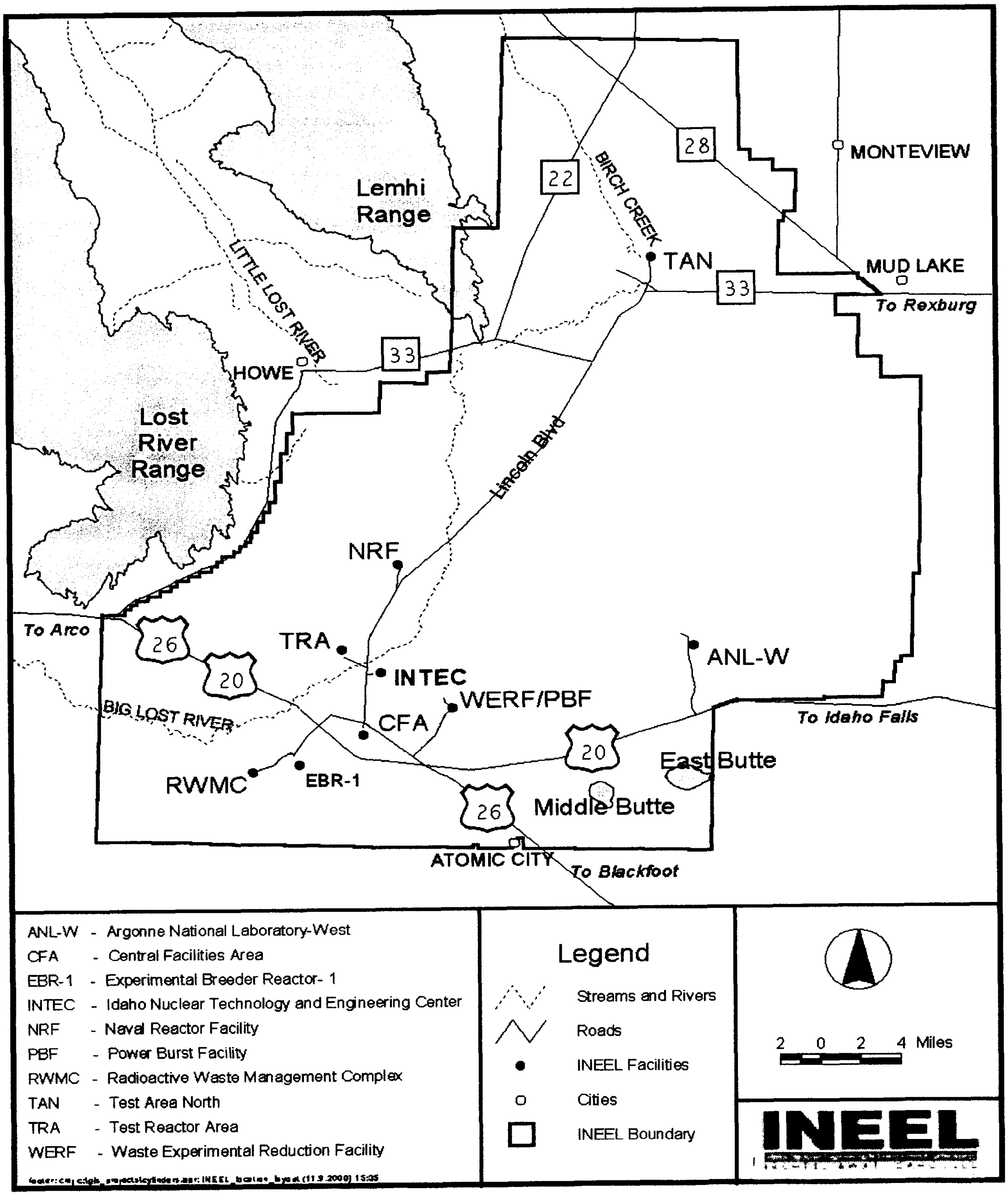

Figure 1-1. INEEL site map showing locations of facilities.

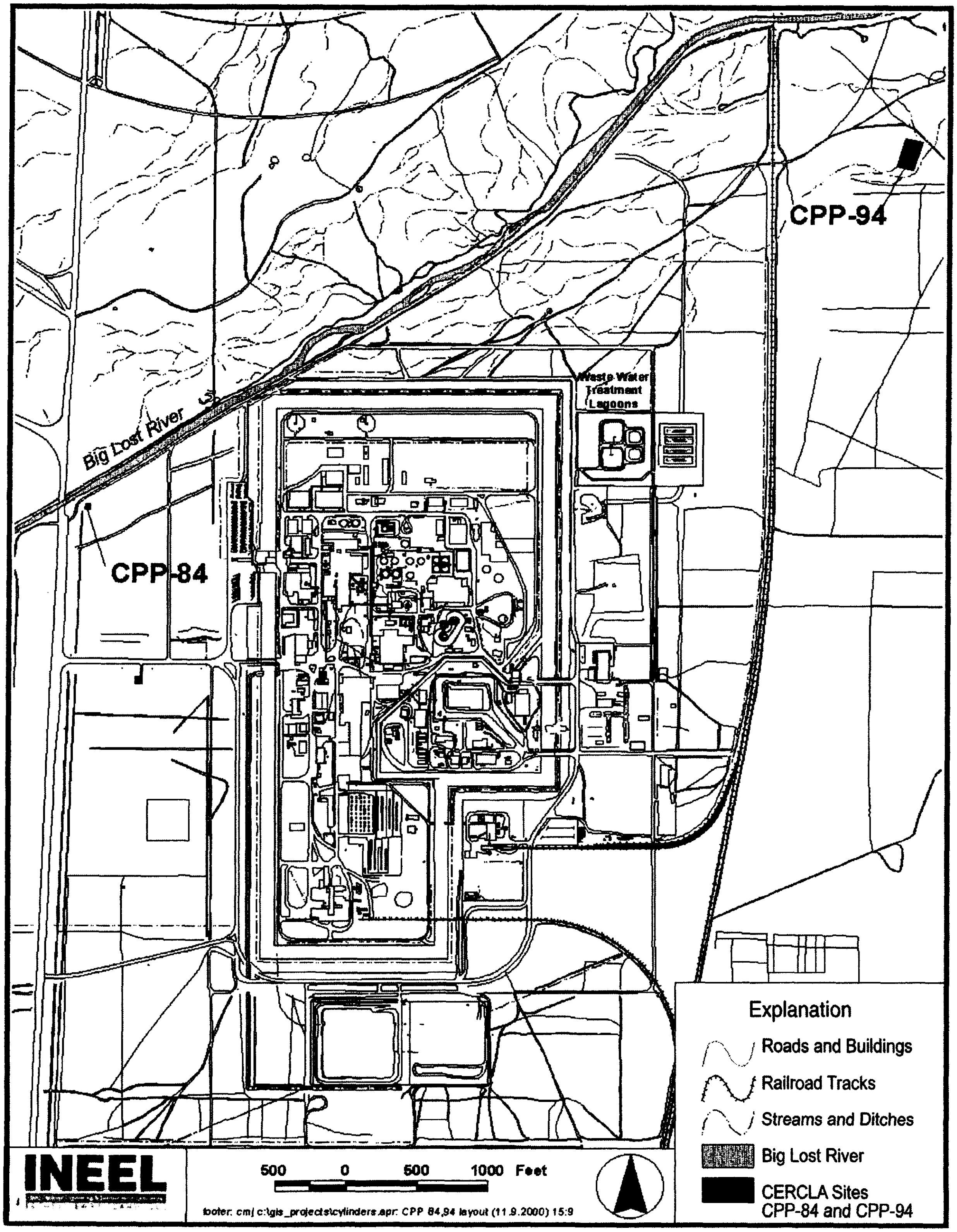

Figure 1-2. INTEC area map showing locations of Sites CPP-84 and CPP-94.

will include venting of inert gases and thermal oxidation of flammable gases to render the cylinders empty. After treatment, the empty cylinders will be rendered useless and disposed at the INEEL Landfill Complex. Backfilling and site grading will complete the field operation at CPP-84.

1.3.2 Site CPP-94 Scope

The cylinder removal phase at CPP-94 has been completed. The Scope of Work used for this phase of the project is provided in Appendix D. Six cylinders were recovered and one of the six had significant pressurization due to hydrogen gas. The empty cylinders were evaluated and determined to be "RCRA empty." The valves on these cylinders were removed, holes were drilled in the cylinders, and the cylinders were disposed at the INEEL Landfill Complex. The sixth cylinder has been shipped to a commercial off-Site treatment, storage and disposal facility (TSDF) where it is being stored pending the acceptance at an appropriate treatment facility. The remaining work for CPP-94 is the post-removal sampling as detailed in the *Preliminary Characterization Plan for OU 3-13 Group 6 RD/RA Buried Gas Cylinders: CPP-84 and CPP-94* (DOE-ID 2000a) (Attachment 1). The details of the removal activities at CPP-94 will be provided in the remedial action (RA) report.

2. ORGANIZATION

The organizational structure for this project reflects the required resources and expertise to perform the work, while minimizing risks to worker's health and safety, the environment, and the public. The positions and names of the individuals in key roles at the site and lines of responsibility and communication, are shown on the organizational chart for this project (Figure 2-1). *NOTE: The names on this figure are current as of March 14, 2001, and are subject to change. A copy of the organization chart showing the most current names will be available at the job site during the removal action.* The following sections outline the responsibilities of project personnel, CFA support staff, and nonfield support staff.

2.1 Field Team

2.1.1 Environmental Restoration Field Project Personnel

All field team members, including Bechtel BWXT Idaho, LLC (BBWI) and subcontract personnel, shall understand and comply with the requirements of this *RD/RA Work Plan*. The field team leader (FTL) and health and safety officer (HSO) will jointly conduct the plan of the day (POD) briefing at the start of each shift. All tasks to be conducted, associated hazards, hazard mitigation, emergency conditions, and emergency actions will be discussed. Input will be provided by the project HSO, industrial hygiene (IH), safety engineering (SE), and radiological control (RadCon) personnel to clarify task health and safety requirements. All personnel are encouraged to provide input and ask questions for clarification of tasks and hazard mitigation methods based on previous lessons learned. Documentation of the POD will be recorded daily in the FTL logbook.

2.1.2 ER Field Construction Coordinator

The environmental restoration (ER) field construction coordinator (CC) is the individual with ultimate responsibility for the safe and successful completion of assigned project tasks. The ER field CC manages field operations; executes the work plan; enforces site control; documents site activities; and may, at the start of the shift, conduct the daily pre-job safety briefings. Health and safety issues at the site must be brought to the construction manager/ER field CC's attention.

If the ER field CC leaves the site, an alternate individual will be appointed to act as the ER field CC. The identity of the acting ER field CC shall be conveyed to site personnel, recorded in the ER field CC daily force report, and communicated to the facility representative when appropriate.

2.1.3 ER Field Team Leader

The ER FTL represents the ER organization at the project with delegated responsibility for the safe and successful completion of the project. The FTL works with the project manager (PM) to manage field sampling or operations and to execute the work plan. The FTL enforces site control, documents activities, and may conduct the daily safety briefings at the start of the shift. Health and safety issues must be brought to the attention of the FTL.

If the FTL leaves the site, an alternate individual will be appointed to act as the FTL. The identity of the acting FTL will be conveyed to site personnel, recorded in the FTL logbook, and communicated to the facility representative, when appropriate.

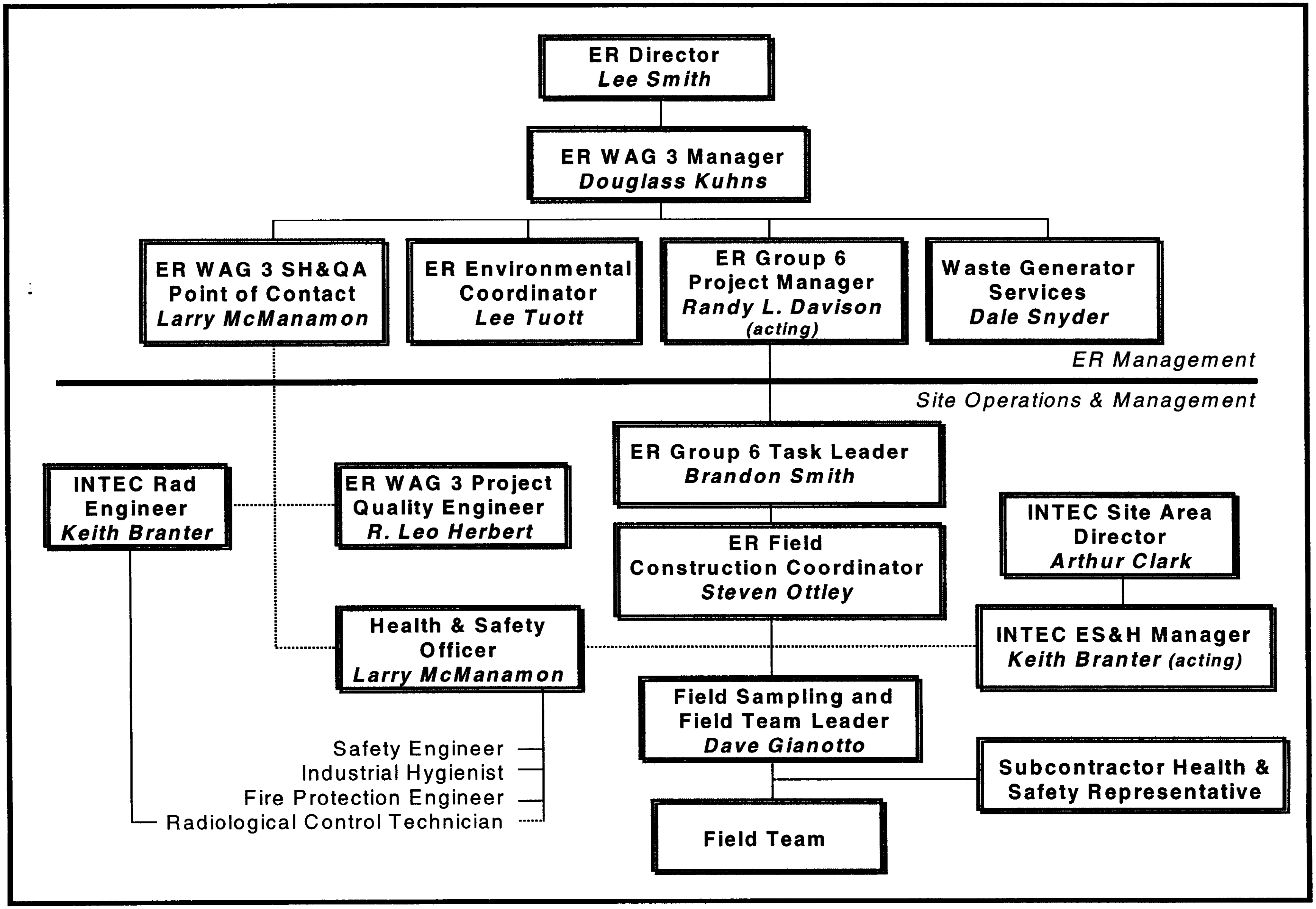

Figure 2-1. Field organization chart for the WAG 3, OU 3-13, Group 6, Buried Gas Cylinders.

2.1.4 ER Health and Safety Officer

The ER HSO is the ER representative assigned to the project who serves as the primary contact for health and safety issues. The HSO advises the safety, health, and quality assurance (SH&QA) point of contact (POC), PM, and FTL on all aspects of health and safety and is authorized to stop work at the site if any operation threatens worker or public health and/or safety. The HSO may be assigned other responsibilities, as long as they do not interfere with the primary responsibilities. The HSO is authorized to verify compliance to the *Health and Safety Plan* (HASP), conduct inspections, require and monitor corrective actions, monitor decontamination procedures, and require corrections, as appropriate. The HSO is supported by SH&QA professionals at the site (SE, IH, radiological control technician [RCT], radiological engineer [RE], environmental coordinator, and facility representative, as necessary) and the ER SH&QA POC.

Persons assigned as the ER HSO, or alternate HSO, must be qualified (per the Occupational Safety and Health Administration [OSHA] definition) to recognize and evaluate hazards and will be given the authority to take or direct actions to ensure that workers are protected. While the HSO may also be the IH, SE, or the FTL (depending on the hazards, complexity, size of the activity involved, and required concurrence from the ER SH&QA Manager) at the site, other HSO's site responsibilities must not conflict (philosophically or in terms of significant added volume of work) with the HSO's primary role.

2.1.5 Occasional Workers

All persons who may be on the site, but are not part of the field team, are considered occasional workers for the purposes of this project (e.g., surveyor, equipment operator, or other crafts personnel not assigned to the project). A person will be considered "on-site" when they are present in or beyond the designated support zone (SZ). Occasional workers per 29 CFR 1910.120/1926.65 shall meet minimum training requirements. If the nature of an occasional worker's tasks requires entry into the exclusion zone (EZ) or radiologically controlled areas, then they must meet all the same training requirements as other field team members. In addition, a site representative must accompany all occasional workers until they have completed three days of supervised field experience.

2.1.6 Visitors

All visitors with official business at the site, including INEEL personnel, representatives of Department of Energy (DOE), and/or state or federal regulatory agencies, may not proceed beyond the SZ without receiving site-specific HASP training, signing a HASP training acknowledgment form, receiving a safety briefing, wearing the appropriate personal protective equipment (PPE), and providing proof of meeting all training requirements. A fully trained site representative (such as the FTL, job safety supervisor (JSS), or HSO, or a designated alternate) will escort visitors at all times while on the site. A casual visitor to the site is a person who does not have a specific task to perform or other official business to conduct at the site. **Casual visitors are not permitted on the site.**

2.2 CFA Support Staff

2.2.1 CFA Site Area Director

The CFA site area director reports to the director of site operations and interfaces with the INTEC facility manager. The CFA site area director is responsible for several functions and processes within the CFA-controlled area that include the following:

- Performing all work processes and work packages

- Establishing and executing a monthly, weekly, and daily operating plan
- Executing the environment, safety, and health (ES&H) program
- Executing the Integrated Safety Management System
- Executing the enhanced work planning
- Executing the Voluntary Protection Program
- Maintaining all environmental compliance
- Executing that portion of the Voluntary Consent Order that pertains to the CFA-controlled area.

2.2.2 Radiological Engineer

Radionuclide contamination is not expected during the removal activities at CPP-84; however, the radiological engineer (RE) and RCT will be responsible for all radionuclide screening and controls. The RE is the primary source for information and guidance relative to the evaluation and control of radioactive hazards at the site. The RE will provide engineering design criteria and review of containment structures and makes recommendations to minimize health and safety risks to site personnel. Responsibilities of the RE include performing radiation exposure estimates and as low as reasonably achievable (ALARA) evaluations, identifying the type(s) of radiological monitoring equipment necessary for the work, advising the FTL and RCT of changes in monitoring or PPE, and advising personnel on the site evacuation and reentry. The RE may have other duties to perform as specified in other sections of the HASP or Company Manuals 15A and 15B (INEEL 2000, 2001).

2.2.3 Radiological Control Technician

The assigned RCT is the primary source for information and guidance on radiological hazards and will be present at the site during all operations. Responsibilities of the RCT include radiological surveying of the site, equipment, and samples; providing guidance for radioactive decontamination of equipment and personnel; and accompanying the affected personnel to the nearest INEEL medical facility for evaluation if significant radionuclide contamination occurs. The RCT must notify the FTL and HSO of any radiological occurrence that must be reported as directed by Company Manual 15A (INEEL 2000).

2.3 Non-Field Support Staff

2.3.1 Environmental Restoration Director

The INEEL ER director has the ultimate responsibility for the technical quality of all projects, maintaining a safe environment, and the safety and health of all personnel during field activities performed by or for the ER Program (ERP). The ER director provides technical coordination and interfaces with the Department of Energy Idaho Operations Office (DOE-ID) Environmental Support Office. The ER director ensures the following:

- Project/program activities are conducted according to all applicable federal, state, local, and company requirements and agreements

- Program budgets and schedules are approved and monitored to be within budgetary guidelines

- Personnel, equipment, subcontractors, and services are available

- Direction is provided for the development of tasks, evaluation of findings, development of conclusions and recommendations, and production of reports.

2.3.2 ER SH&QA Manager

The ER SH&QA manager or designee responsibilities are to manage their resources to ensure that SH&QA programs, policies, standards, procedures, and mandatory requirements are planned, scheduled, implemented, and executed in the day-to-day operations for the ERP at the INEEL. This manager directs the SH&QA compliance accomplishment of all activities by providing administrative technical/administrative direction to subordinate staff and through coordination with related functional entities. The ER SH&QA manager reports directly to the ER director. Under the ER director's guidance, the ER SH&QA manager represents the ER directorate in all SH&QA matters. This includes responsibility for ERP's SH&QA management compliance and oversight for all ER Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and decontamination, dismantlement, and decommissioning operations planned and conducted at all WAGs, including WAG 3, INTEC, and for ERP INEEL-wide environmental monitoring activities.

The ER SH&QA manager is responsible for the management of the following technical disciplines and implementation of the programs related to these disciplines:

- RadCon personnel

- Industrial safety personnel

- Fire protection personnel

- QA personnel

- IH personnel (matrixed)

- Emergency preparedness personnel.

2.3.3 ER WAG 3 Manager

The BBWI ER WAG 3 manager shall ensure that all activities conducted during the project comply with Company management control procedure (MCPs) and program requirements directives (PRDs); all applicable OSHA, Environmental Protection Agency (EPA), DOE, U.S. Department of Transportation (DOT), and State of Idaho requirements; and that tasks comply with PLN-125, "Quality Program Plan for the Environmental Restoration Program," for the project. The WAG 3 manager is responsible for the overall work scope, schedule, and budget. The WAG 3 manager will ensure that an Employee Job Function Evaluation (Form-340.02) is completed for all project employees, reviewed for validation by the project IH, and then submitted to the Occupational Medical Program (OMP) for determination of whether a medical evaluation is necessary.

2.3.4 ER Group 6 Project Manager

The ER PM will ensure that all activities conducted during the project comply with Company MCPs and PRDs; all applicable OSHA, EPA, DOE, DOT, and State of Idaho requirements; and that tasks comply with PLN-125, the quality assurance project plan, the HASP, and the field sampling plan. The PM is responsible for coordination of all document preparation, field, laboratory, and modeling activities. The PM is responsible for the overall work scope, schedule, and budget. The PM will ensure that an Employee Job Function Evaluation (Form 340.02) is completed for all project employees, reviewed by the project IH for validation, and then submitted to the OMP for determination of whether a medical evaluation is necessary.

2.3.5 ER WAG 3 SH&QA Point of Contact

The ER WAG 3 SH&QA POC, or designee, directs the SH&QA compliance activities by providing technical and administrative direction to project staff and through coordination with related INTEC SH&QA functional entities. The ER SH&QA POC reports directly to the WAG 3 manager. Under the direction of the WAG 3 manager, the WAG 3 SH&QA POC represents the WAG in all SH&QA matters. This includes assisting the WAG 3 manager in being responsible for WAG 3 SH&QA compliance and oversight for CERCLA operations planned and conducted at the INTEC.

2.3.6 ER Environmental Coordinator

The assigned ER environmental coordinator oversees, monitors, and advises the PM and FTL performing site activities on environmental issues and concerns by ensuring compliance with DOE orders, EPA regulations, and other regulations concerning the effects of site activities on the environment. The ER environmental coordinator provides support surveillance services for hazardous waste storage and transport and surface water/stormwater runoff control.

2.3.7 ER Quality Engineer

A quality engineer provides guidance on the site quality issues. The quality engineer observes site activities and verifies that site operations comply with quality requirements pertaining to these activities. The quality engineer identifies activities that do not comply or have the potential for not complying with quality requirements.

2.3.8 Waste Generator Services

Waste Generator Services (WGS) personnel are responsible for the compliant management of waste generated during the project. These personnel coordinate both with the ER Group 6 project manager as well as the CC and the FTL. Their responsibilities include providing guidance on all aspects of waste characterization, waste storage, and waste disposal.

3. DESIGN CRITERIA

The design requirements for the Group 6 remedial action were developed to achieve objectives specified in the OU 3-13 ROD. The final design was driven by the selected remedy to remove, treat, and dispose of gas cylinders at each site. Through these actions, all future environmental and safety hazards posed by these cylinders will be eliminated. The criteria identified in this section will be implemented in accordance with all applicable state and federal environmental regulations, DOE orders, OSHA regulations, and industry standards. These include the following:

- Applicable environmental regulations are provided in Table 4-1, Group 6, Buried Gas Cylinders, ARARs
- DOE Order 435.1
- DOE Order 151
- 29 CFR 1910 Occupational Safety and Health Standards
- 29 CFR 1926 Occupational Safety and Health Construction Standards
- Compressed Gas Association Guidance and Standards (complete list in Section 9, References).

3.1 Project Description

This section describes the removal action of cylinders at CPP-84, including verification surveys, cylinder and soil sampling, treatment, and disposal. An expedited remedial action of the cylinders at CPP-94 has been completed. The post-removal characterization of the soil, excavation and backfilling of any contaminated soil (if necessary), and site regrading will still be performed at CPP-94.

Records indicate that the cylinders buried at CPP-84 were used during the initial construction of INTEC, completed in 1952. These records include maintenance logs from Igloo 638, chemical index sheets from the 660 Cylinder Dock, and interviews with INTEC personnel. The compilation of this information indicates that cylinder contents are limited to acetylene, compressed air, argon, carbon dioxide, helium, nitrogen, and oxygen. Accordingly, the removal action at CPP-84 is designed to facilitate the safe removal, sampling, treatment, and disposal of these gases and cylinders. Field activities described in this work plan are designed to identify hazards and to allow for the safe and proper handling of any potential unknowns. Figure 3-1 provides a graphical description of the expected condition at the site, the types of site controls/monitoring, and possible contingency planning activities. This figure is based on the assumption of the only wastes that will be encountered are cylinders containing construction gases. If other wastes are encountered, they will be safely managed in accordance with established INEEL procedures. Section 6.6 of the *Waste Management Plan* (Attachment 4) addresses how other waste types encountered will be characterized and managed. Section 7.3 of this *Work Plan* and Section 7.1.6 of the *Waste Management Plan* address how these wastes may be treated.

The removal action will be accomplished by mechanical and hand excavation. Prior to removal from the excavation site, the cylinders will be inspected for integrity. The cylinders will be preliminarily segregated into compatible groups and safely stored. Shortly after the removal action, the cylinders will be sampled for identification purposes and appropriately treated onsite. The treatment approach includes venting to the atmosphere for inert gases, and thermal oxidation of nontoxic, flammable gases.

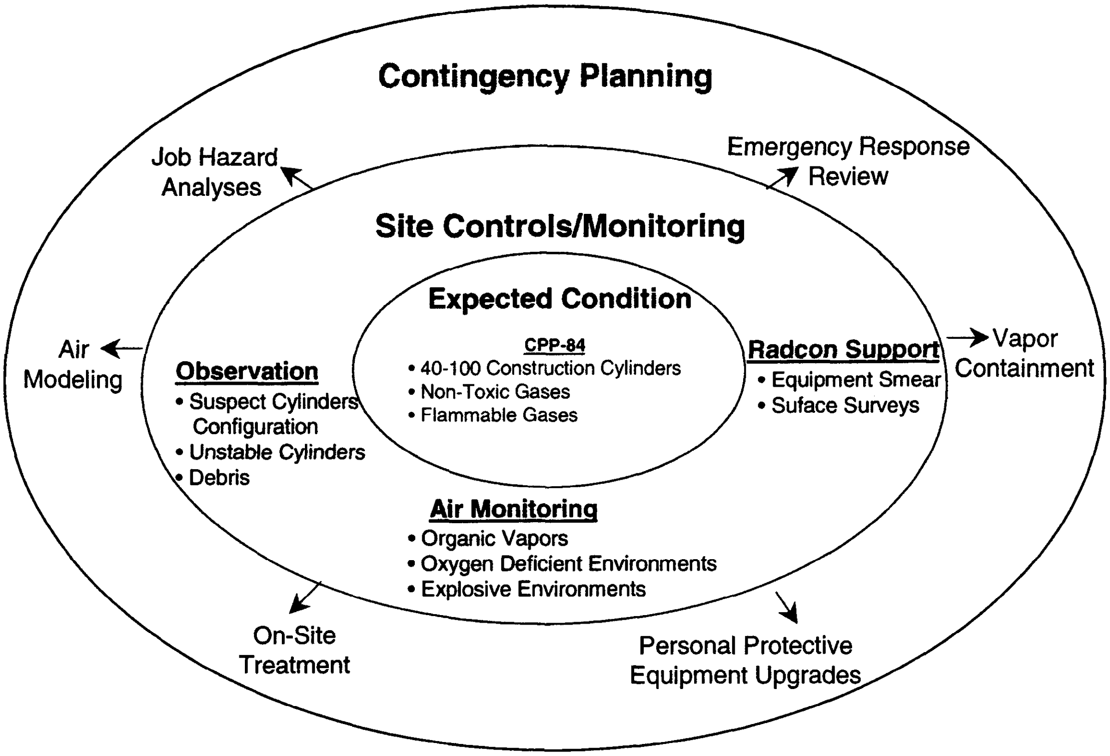

Figure 3-1. Factors that support contingency planning.

Several remedial methods are required to successfully complete the remedial action at these sites. These methods can be summarized on the basis of sampling, treatment, and disposal. A brief summary with regards to cylinder remediation is provided below.

3.1.1 Sampling Methods

Cylinder sampling methods are based solely on cylinder and valve integrity. For cylinders with operable valves, a remotely operated system, the valve sampling station (VSS) will be used. This system allows the operator to remotely view the sampling operation using video equipment. For cylinders that are in poor condition or with inoperable valves, the cylinder recovery vessel (CRV) will be used. The CRV is a remotely operated, pressure-rated, vessel that is housed within in a secondary containment chamber for the containment of fugitive gases. The cylinder is pierced within the CRV, allowing the contents of the cylinder to be sampled and analyzed.

Analysis of gases collected from each cylinder will be performed at an onsite laboratory using two primary instruments: a Fourier transform infrared spectrometer (FTIR) and/or a mass spectrometer (MS). The FTIR can provide the identification of most gases; however, the presence of elemental gases (such as oxygen, nitrogen, etc.) cannot be detected by the FTIR. The use of MS instrumentation is required for the identification of these gases. In each case, spectra generated from the samples are compared with an onsite computer library to produce the qualitative identification.

It is important to note that soil samples will be collected at the bottom of the completed excavation and from the spoil piles to confirm that no contaminants above risk-basked concentrations are left in-place. An EPA-certified, off-Site laboratory will analyze these soil samples.

3.1.2 Treatment Methods

Cylinder treatment methods are based on the contents of each cylinder, confirmed by the analytical results from the onsite laboratory. Cylinder contents cannot be assumed by exterior markings or valve configurations. Treatment methodologies are based on the assumption that only construction gas cylinders were discarded. Elemental gases, such as nitrogen, oxygen, helium, argon, and carbon dioxide, can be vented to the atmosphere. For flammable gases, such as acetylene, thermal oxidation is the preferred technology. Although not anticipated, if other gases are retrieved, efforts will be made to perform onsite treatment. Depending on the gas type, these treatment methods can range from a simple venting or flaring technique to more complex catalytic or chemical oxidation treatments. If onsite treatment is not feasible, a suitable off-Site TSDF will be identified to manage all unexpected gases.

3.1.3 Disposal Methods

The nonacetylene RCRA empty cylinders [40 CFR 261.7 (a) (1) and (b) (1)] meeting the *INEEL Reusable Property, Recyclable Materials, and Waste Acceptance Criteria* (RRWAC)(DOE/ID 1999b) for industrial waste will be disposed at the INEEL Landfill Complex. These cylinders will be rendered useless through valve removal and cutting or puncturing. . Wastes not meeting the acceptance criteria for the INEEL Landfill Complex will be stored pending disposition in the INEEL CERCLA Disposal Facility (ICDF) or will be transported to an off-Site disposal facility. Acetylene cylinders are constructed with a porous filler (usually asbestos) and a solvent (acetone) to provide for safe operations. Due to environmental and waste management concerns regarding these substances, after the oxidation of the cylinder contents, the cylinder bodies will be transported to an off-Site disposal facility. Prior to shipment of any waste generated by this project to a facility that is off the INEEL (off-Site), a suitability determination will be completed and provided to the Agencies in accordance with 40 CFR 300.440.

3.2 Data Quality Objectives

The data collection objectives are discussed in the context of the data quality objectives (DQOs) process, as defined by *Guidance for the Data Quality Objectives Process* (EPA 1994), discussed in the *Quality Assurance Project Plan* (DOE/ID 2000f) and mandated for use in accordance with company procedures. The DQO process was developed by the EPA to ensure that the type, quantity, and quality of data used in decision-making are appropriate for the intended application. The DQO process includes seven steps, each of which has specific outputs. The seven steps with a brief explanation of each follow:

1. *State the problem.* Concisely describe the problem to be studied. Review prior studies and existing information to gain an acceptable understanding of the problem.

2. *Identify the decision.* Using new data, identify the decision that will solve the problem.

3. *Identify the inputs to the decision.* Identify the information that needs to be learned and the measurements to be taken in order to resolve the decision.

4. *Define the study boundaries.* Specify the conditions (time periods and situations) to which decisions will apply and within which the data should be collected.

5. *Develop a decision rule.* Integrate the outputs from previous steps into an "if...then" statement that defines the conditions that would cause the decision-maker to choose among alternative actions.

6. *Specify acceptable limits on decision errors.* Define the decision-maker's acceptable decision error rates based on a consideration of the consequences of making an incorrect

decision. A decision error rate is the probability of making an incorrect decision based on data that inaccurately estimate the true state of nature.

7. *Optimize the design.* Evaluate information from the previous steps and generate alternative sampling designs. Choose the most resource-efficient design that meets all DQOs.

The DQOs for this project has been separated into two distinctive groupings; (1) DQOs to support cylinder removal at CPP-84; and, (2) DQOs to support the post-removal soil sampling at both CPP-84 and CPP-94.

3.2.1 DQOs to Support Cylinder Removal

A series of shallow (< 6 in.) and deep (approximately 48 in.) magnetometer readings will be the primary measurement to verify that the removal of buried cylinders is complete. The 48-in. depth for taking magnetometer readings is based on the maximum anticipated depth of burial based on the available data. Hand-probing, visual observation (debris, staining, etc.), radiological surveys, and air monitoring will also support the determination. Table 3-1 details DQOs for the cylinder removal process.

3.2.2 DQOs to Support Post-Removal Soil Sampling

It is unlikely that soil contamination will exist at either CPP-84 or CPP-94. However, post-removal soil sampling will be completed to verify that no contaminants of potential concern (COPC) are left in place after the excavation process. Table 3-2 details the DQOs for the post-removal soil sampling. The table only addresses COPCs that may be present due to the waste types expected to be excavated. If other waste types are identified during the removal action, additional parameters will be evaluated on a case-by-case basis. The sampling plans for these activities have been provided in the *Preliminary Characterization Plan for OU 3-13, Group 6, RD/RA Buried Gas Cylinder Sites: CPP-84 and CPP-94* (DOE-ID 2000a). This reference is provided in Attachment 1.

3.3 Performance Standards

The definition of performance standards is crucial to the successful completion of any remedial project. Both upper-tier (remedial action objectives) and lower-tier (remediation goals) performance standards are required to adequately define success. These performance standards are further discussed below.

3.3.1 Remedial Action Objectives

The remedial action objective (RAO) for Group 6, Buried Gas Cylinders, as defined in the ROD is to "eliminate the safety hazard posed by buried compressed gas cylinders at sites CPP-84 and CPP-94" (DOE 1999a). All RAOs were developed in accordance with the National Contingency Plan, and CERCLA RI/FS guidance.

3.3.2 Remediation Goals

Remediation goals (RGs) are developed to ensure that the remedial activities succeed in meeting the RAO. RGs are normally contaminant-specific, risk-based cleanup levels that are calculated for a given environmental media and contaminant exposure scenario. Since the cylinders at CPP-84 are a safety hazard and do not present a typical contaminant exposure scenario, the RG for CPP-84 is simply the removal of all buried cylinders. The Group 6 DQOs, provided in Section 3.2, specify the data required to meet the RGs and the measurements that will define a successful remedial action. Risk-based

Table 3-1. Pre-removal data quality objectives for OU 3-13 Group 6 (CPP-84 and CPP-94).

Step 1. Problem Statement	Step 2. Decision Statement	Step 3. Decision Inputs	Step 4. Study Boundaries	Step 5. Decision Rules	Step 6. Decision Error Limits	Step 7. Data Collection Design[a]
State the problem Insufficient data exists at sites CPP-84 and CPP-94 to adequately define the spatial extent of the buried gas cylinders. A more thorough characterization into the surface and subsurface distribution of buried cylinders is needed to guide and direct excavation and removal activities. Note: *The intent of this data collection is to provide qualitative information and guidance to support removal activities.*	***Identify the principal study question (PSQ)*** What is the spatial distribution and extent of the buried gas cylinders? ***Alternative actions resulting from resolution of the PSQ*** Alt 1: The distribution and extent of the buried gas cylinders will be better characterized. Alt 2: The distribution and extent of the buried gas cylinders will not be better characterized. ***Make Decision Statement*** Determine whether or not the distribution and extent of the buried gas cylinders has been adequately addressed.	***Identify information required to resolve the decision statement.*** High-resolution magnetic-gradient geophysical surveys to locate ferrous metal objects, particularly gas cylinders. ***Determine Action Levels*** The action level will be the presence or absence of buried metal objects. ***Confirm methods are available*** Appropriate magnetic and/or electromagnetic methods and equipment materials are available via a subcontractor. Note: *Portable isotopic neutron spectroscopy (PINS) may be used to screen for the presence/absence of HF in the fully exposed cylinder at CPP-94. This information would be used in helping plan for cylinder removal activities.*	***Specify characteristics that define the populations*** INEEL surface soils, subsurface soils, and ferrous metal objects associated with the sites. ***Define spatial boundary*** In addition to the presently defined boundaries at each site, the geophysical survey will extend to the surrounding areas (as much as one to two acres) as determined by project needs. ***Define temporal boundary*** Temporal boundaries will only be limited by field conditions (weather, site access) and project schedule. It is assumed geophysical survey results will represent the presence or absence of cylinders at the time the survey is conducted and into the future. ***Define scale in decision making*** The minimum scale of decision making will be determined by the resolution capabilities of the instrumentation (expected to be 6" x 20"). A larger decision scale may be used based on project needs. ***Identify practical constraints*** Procedures for the geophysical survey may need to take into account additional safety requirements as determined by safety specialists. Large physical objects (e.g. rocks, sagebrush) may be moved/eliminated to obtain straight uninterrupted transects.	***Specify the statistical parameter that characterizes the populations*** The intent of the geophysical surveys is to provide a qualitative characterization of each site. The only statistical parameters used for site characterization will be the number and location of suspected buried cylinders as detected by the geophysical surveys. The performance of the survey instrumentation, as specified by the instrument manufacturer, will adequately meet the requirements of the project. ***Specify the Action Levels*** Action levels will be based on presence/absence (detect/non-detect) criteria as determined by instrument sensitivity. For detects, action levels will take into account the size and intensity of the survey reading. ***State the decision rule*** *IF* buried metal objects are detected, *THEN* survey specialists and project managers will evaluate the data in making remediation decisions.	***Determine possible ranges of parameters of interest*** The range of parameters of interest are based upon the size of metal objects buried at each site. It is expected that most of the metal objects will be the size of a gas cylinder or smaller. ***Identify decision errors and choose the null hypothesis*** The two decision errors are: (a) Cylinders are not detected in an area, when in fact they are present (false negative). (b) Cylinders are detected in an area, when in fact they are not present (false positive). ***Identify decision error consequences*** (a) Cylinders may remain at the site(s) if not discovered during the geophysical survey or during removal activities. (b) Time spent searching for cylinders that are not present would add unnecessary costs to the project. ***Assign probability values to reflect tolerable decision errors*** The geophysical surveys are being used to qualitatively assess the presence and absence of buried metal objects and help direct removal actions. The measurements are taken on the grid intersections of a grid with 6" by 20" spacing. Because the instrument can detect metal ~0.9 m (3 ft) before it is directly above it, the probability of not detecting a cylinder of 6" radius (in any orientation) down to a depth of 4-5 ft (1.2-1.5m) is extremely low. Therefore, the performance and operation of the surveying equipment within the manufacturer's specifications and instructions, and the planned resolution of the survey will provide acceptable decision error limits.	***Review existing data, DQO outputs, and develop data collection design.*** The site background and conditions will be evaluated. A local survey grid will be placed and marked in the field. Using the Rapid Geophysical Surveyor, the site will be covered with a detailed magnetic field survey made up of a series of closely spaced profiles (data spacing – 6 in. (15 cm), profile spacing – 20 in. (51 cm), approx. 50,000 points/acre) to identify cylinder burial sites and the trench perimeter. Maps will be produced that represent the findings made in the field. Following removal activities, a confirmation magnetic field survey may be conducted at each site. [a]For details on pre-removal data collection design, see Section 3.

Table 3-2. Post-removal data quality objectives for OU 3-13 Group 6 (CPP-84 and CPP-94).

Step 1. Problem Statement	Step 2. Decision Statement	Step 3. Decision Inputs	Step 4. Study Boundaries	Step 5. Decision Rules	Step 6. Decision Error Limits	Step 7. Data Collection Design*

State the problem
Confirmatory data is needed to assess if CPP-84 or CPP-94 will require further investigation and/or soil remediation after the buried gas cylinders have been removed.
	Identify the principal study question (PSQ)
	Are there indications that COPC concentrations warrant further investigations or actions at CPP-84 or CPP-94?
	
	Alternative actions resulting from resolution of the PSQ
	Alt 1: No further investigation or actions at the sites will be recommended.
	
	Alt 2: Further investigation or actions at the sites will be recommended.
	
	Make Decision Statement
	Determine whether COPCs at CPP-84 and/or CPP-94 exceed a defined action level and require further investigation to make remedial decisions.
		Identify information required to resolve the decision statement.
		CPP-84:
		• Acetone concentration (soil)
		• Asbestos concentration (soil)
		Note: *Asbestos samples will only be collected if visual evidence indicates asbestos-containing material (ACM) may be present.*
		• Metal concentrations (soil)
		The following metals will be used as indicators of leaching:
		• Arsenic
		• Barium
		• Beryllium
		• Cadmium
		• Chromium
		• Cobalt
		• Copper
		• Iron
		• Lead
		• Mercury
		• Nickel
		
		CPP-94:
		• Total Fluoride (HF byproduct)
		• Indicator metals as listed above
		
		Determine Action Levels
		The action levels for this project are derived from EPA Region III &IX Risk Based Concentration (RBC) table for metals and VOCs. The exposure scenario used for this project is the residential scenario.
		
		Confirm methods are available
		SW-846 methods are available for VOCs and metals. NOSH analytical methods are available for asbestos (if needed).
			Specify characteristics that defines the populations
			INEEL soils, soil particles <2 mm, absent of gross size organic materials.
			
			Define spatial boundary
			Excavated area:
			Will be defined upon the vertical and horizontal extent of the excavation activities. Initial estimates of the excavated area for CPP-84 are 20 x 30 ft (6 x 9m). Initial estimates of the excavated area for CPP-94 are 10 x 10 ft (4 x 4m).
			
			Excavated soil:
			Will be based upon the soil removed during cylinder excavation activities (spoil pile).
			
			Define temporal boundary
			Temporal boundaries are only limited by field conditions (weather, site access) and project schedule. It will be assumed that the sampling data represents both the current and future COPCs concentrations at the sites.
			
			Define scale in decision making
			The population to be considered at each site is the soil at the bottom of the excavation (under the removed cylinders). If visual evidence indicates it necessary, the excavated soil (spoil pile) may also be considered. The scale for decision making will be the excavation as a whole and, if necessary, the excavated soil as a whole.
			
			Identify practical constraints
			Procedures for excavation sampling may need to take into account additional safety requirements, depending on the depth and slope of the excavation. Procedures for sampling excavated soil will need to consider the potential for limited accessibility to all points within the spoil pile.
				Specify the statistical parameter that characterizes the populations
				The range and mean concentrations for metals, fluoride, asbestos, and acetone will be the statistical parameter used to characterize the population. Note: *Asbestos samples will only be collected if visual evidence indicates asbestos containing material (ACM) may be present*
				
				Specify the Action Levels
				Action levels are based on EPA Region III, & IX RBC tables for metals and VOCs (residential scenario):
				
				COPC (mg/kg)
				Arsenic: 3.1 E+01
				Acetone: 1.6 E+03
				Barium: 5.5 E+03
				Beryllium: 1.6 E+02
				Cadmium: 3.7E+01
				Chromium IV: 2.3 E+02
				Cobalt: 4.7 E+03
				Copper: 3.1 E+03
				Fluoride: 3.7 E+03
				Iron: 2.3 E+04
				Lead: 4.0 E+02
				Mercury: 2.3 E+01
				Nickel: 1.6 E+03
				Asbestos: >1%
				
				State the decision rule
				IF a COPC concentration exceeds an RBC, *THEN* removal, remediation, and/or disposal actions will be determined.
					Determine possible ranges of parameters of interest
					Metals are expected to be in the range for INEEL soil background concentrations as listed in Rood, et al, 1995.
					Fluoride (total) concentrations in soil are expected to range between 100-250 mg/kg. The mean fluoride concentration is expected to be less than 250 mg/kg.
					Asbestos and acetone are expected to be less than the detection limit for the applicable analytical methods.
					Identify decision errors and choose the null hypothesis
					The two decision errors are:
					(a) Soils do not contain unacceptable COPC concentrations, when they truly do (false negative).
					(b) The soils do contain unacceptable COPC concentrations, when they truly do not (false positive).
					Identify decision error consequences
					(a) Contaminants that potentially pose a health or environmental hazard would remain at the site(s).
					(b) The unnecessary removal, remediation, or disposal actions would add significant costs to the project.
					
					Define H_o and H_A
					H_O: The soil *does not* contain COPCs significantly above background.
					H_A: The soil *does* contain COPCs significantly above background.
					
					Assign probability values to reflect tolerable decision errors
					For preliminary site investigations, less stringent statistical parameters are required for characterization. The tolerance for decision errors in this preliminary characterization are based on the following justifications:
					• Presently, no evidence of soil contamination exists at the site
					• Asbestos, if present, is non-friable and bound inside the cylinders
					• Unacceptably high fluoride or acetone concentrations would significantly exceed the 'gray region' of the DQO process.
					• High acetone concentrations would be revealed during remediation activities (industrial hygiene monitoring).
					• There is a low probability for extensive metal contamination from buried cylinders.
					• The purpose of a preliminary site investigation is to provide information for initial management decisions and to determine if further investigation is deemed necessary. (EPA's Soil Sampling Quality Assurance User's Guide)
					
					Based on the purpose of the characterization, the above justifications, and EPA guidance *(EPA/600/8-89/046 Soil Sampling Quality Assurance User's Guide)*, the following probability values and statistical parameters have been established:
					
					Confidence Level: 80%
					Minimum Detectable Difference: 30%
					Power: 90%
					Coefficient of Variation: 30%
					Number of samples required: 5 samples
						Data Collection/Sampling Designs
						Excavated area:
						Based on the DQOs of this project, a simple random sampling design combined with increment delimitation will be used for data collection. This design allows for estimating the variability (standard deviation) of the COPCs (if present) and also allows for comparing the COPCs against actions levels using a students *t*-test. Excavated areas will be divided into grids based on cylinder location(s). Five grid locations will be randomly selected for sampling. One composite sample will be collected from the five grids (plus one duplicate).
						
						Excavated soil (Spoil pile):
						If evidence indicates that contaminants may be present in the spoil pile (e.g., differences in soil color, moistness, texture, odor), a splitting method using fractional shoveling combined with systematic random sampling will be used to obtain soil samples. This design allows for estimating the variability of the COPCs (if present) and allows for comparing the COPCs against actions levels using a students *t*-test.
						
						The established statistical parameters are as follows:
						Confidence Level: 80%
						Minimum Detectable Difference: 30%
						Power: 90%
						Coefficient of Variation: 30%
						Number of samples required:
						• Excavations:
						  • 5 soil samples from CPP-84 (plus 1 duplicate)
						  • 5 soil samples from CPP-94 (plus 1 duplicate)
						• Spoil piles (If needed)
						  • 5 soil samples from CPP-84 (plus 1 duplicate)
						  • 5 soil samples from CPP-94 (plus 1 duplicate)
						• No equipment rinsates are required because dedicated/disposable sampling equipment will be used (see Section 3).
						
						Biased Samples:
						The collection of biased samples will be conducted if visual evidence indicates contaminants could be present in an area that might otherwise be missed (e.g., spoil pile, excavation portions not containing cylinders).
						
						***For details on post-removal data collection design, see Section 3.**

concentrations for the soil (excavation floor) are defined in the *Preliminary Characterization Plan for OU 3-13, Group 6, RD/RA Buried Gas Cylinder Sites: CPP-84 and CPP-94* (DOE-ID 2000a) (Attachment 1).

3.3.3 Performance Measurement Points

The performance of the remedial action will be evaluated against the Group 6 RAOs and RGs discussed above. The measuring points will be controlled temporally by the completion of the removal action. Magnetometer surveys (deep and shallow) and soil sampling will be completed at the final excavation grade to ensure compliance with the RGs. Since the removal of the cylinders will mitigate any potential future safety hazards, long-term monitoring at these sites will not be required. However, a prefinal and final inspection will be completed by the Agencies. Compliance with the performance measuring points will be discussed in the remedial action (RA) report. If it is determined that the prefinal inspection will serve as the final inspection, the date for submitting the final inspection will be 60 days after making this determination. Appendix C contains a draft copy of the prefinal inspection checklist. This checklist will be reviewed and updated as necessary upon completion of the project.

3.4 Technical Factors of Importance in Design and Remediation

The three most important technical factors in this remedial action are the number of cylinders, cylinder contents, and cylinder integrity. CPP-84 is thought to contain between 40 and 100 construction gas cylinders. This is supported by maintenance and operation records as well as interviews from INTEC personnel. These variables are further discussed in Sections 3.4.1 through 3.4.3. Other factors such as subsurface geometry (i.e. depth to basalt and maximum depth of cylinders); local soil characteristics (soil moisture content, particle grading, and frozen soil); and weather conditions (wind speed, precipitation, temperature) can also present technical challenges.

3.4.1 Number of Cylinders

The actual number of cylinders discarded at CPP-84 is a factor in determining the design of the remedial action. Records indicate that between 40 and 100 cylinders are buried at CPP-84. The design and configuration of the exclusion zone, contaminant reduction zone, and support zone are heavily influenced by the number of cylinders removed from the site. The amount of time and space required to stage, sample, and treat the abandoned cylinders is proportional to the number of cylinders removed from the site.

3.4.2 Cylinder Content

Cylinder content is the most important factor in the design of the remedial action. Records indicate that the cylinders discarded at CPP-84 contain construction gases from the construction of INTEC. These gases include acetylene, compressed air, argon, carbon dioxide, helium, nitrogen, and oxygen. This removal action is designed to safely handle, sample, and treat these gases. However, observations, field screening, or analytical results may identify the presence of other substances. Based on the type of material identified, the design of the remedial action may require modification including upgrades to PPE, construction of vapor contaminant and treatment facilities, and the evaluation of potential release and emergency response scenarios.

3.4.3 Cylinder Integrity

Cylinder integrity is another important factor that controls remedial design and remedial action consideration. If the cylinders are in stable condition and the valves are operable, the handling and sampling procedures are relatively simple. Specialized equipment is required to support the handling and sampling of cylinders with inoperable valves or unstable cylinders. For example, a cylinder may have been subject to extremely corrosive environments or the valve cap may have been damaged or "frozen" in place. Figure 3-2 shows an example of a damaged valve cap. Handling of unstable cylinders may require the use of cylinder over packs. Figure 3-3 shows an example of typical cylinder over packs. Large over pack vessels are available to handle bent, bulging, or other cylinders retrieved that will not fit into the typical cylinder over packs depicted in Figure 3-3.

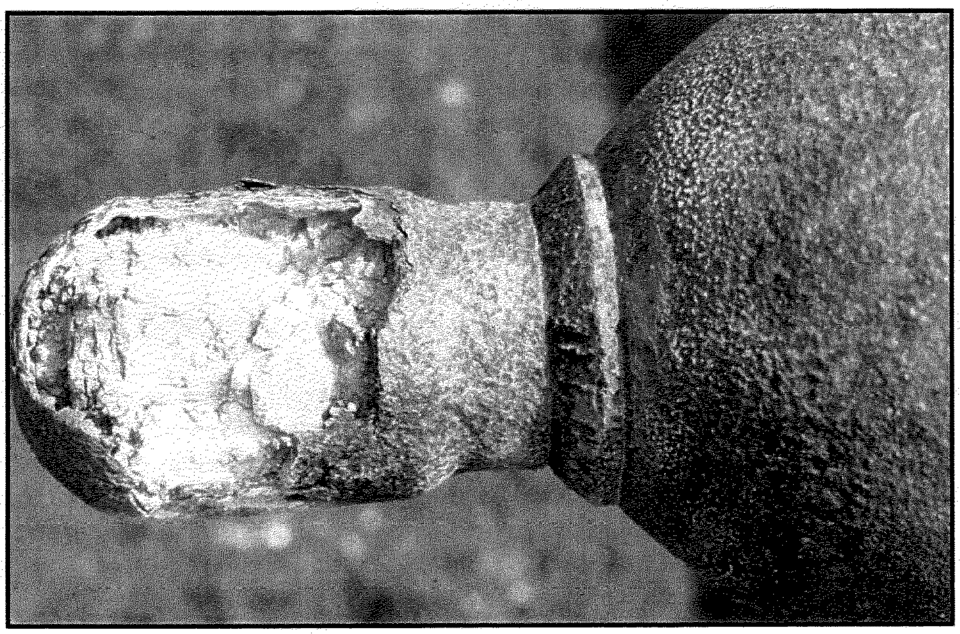

Figure 3-2. Example of damaged valve cap.

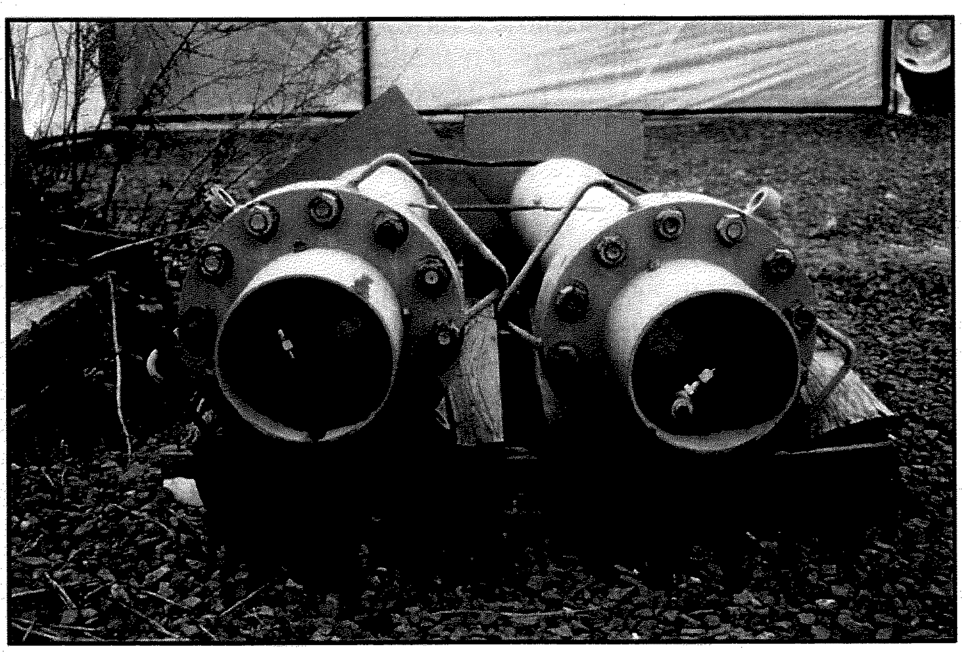

Figure 3-3. Example of cylinder overpacks.